

1. A town has an initial population of 90000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	89960	89920	89880	89840	89800	89760	89720	89680	89640

- A. Exponential
- B. Non-Linear Power
- C. Linear
- D. Logarithmic
- E. None of the above

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2. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 506 grams of element X and after 4 years there is 72 grams remaining.

- A. About 1 day
- B. About 730 days
- C. About 1825 days
- D. About 365 days
- E. None of the above

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3. The temperature of an object, T , in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's

temperature, T , based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 130° C and is placed into a 11° C bath to cool. After 19 minutes, the uranium has cooled to 77° C .

- A. $k = -0.03568$
- B. $k = -0.03102$
- C. $k = -0.03816$
- D. $k = -0.03758$
- E. None of the above

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4. The temperature of an object, T , in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T , based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 160° C and is placed into a 17° C bath to cool. After 16 minutes, the uranium has cooled to 113° C .

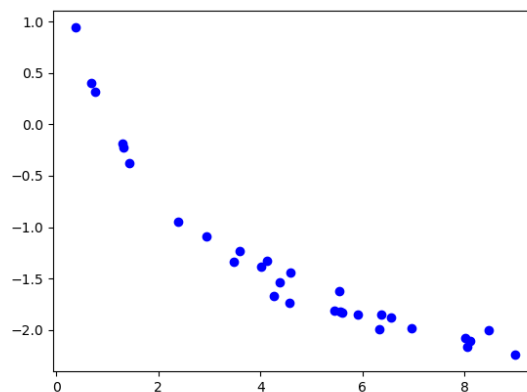
- A. $k = -0.04784$
- B. $k = -0.03193$
- C. $k = -0.04696$
- D. $k = -0.02491$
- E. None of the above

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5. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 508 grams of element X and after 4 years there is 50 grams remaining.

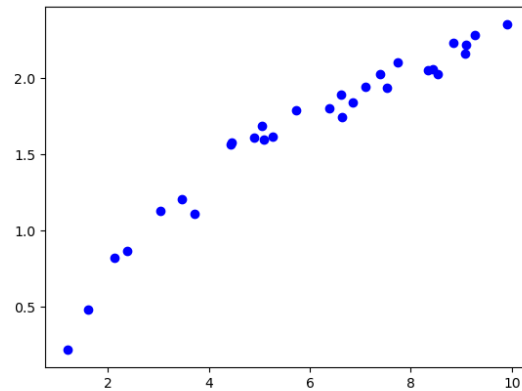
- A. About 365 days
- B. About 365 days
- C. About 1 day
- D. About 1825 days
- E. None of the above

6. Determine the appropriate model for the graph of points below.



- A. Logarithmic model
- B. Non-linear Power model
- C. Exponential model
- D. Linear model
- E. None of the above

7. Determine the appropriate model for the graph of points below.



- A. Non-linear Power model
- B. Exponential model
- C. Linear model
- D. Logarithmic model
- E. None of the above

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8. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate (*rounded to the nearest minute*) replication rate of bacteria- α .

A newly discovered bacteria, α , is being examined in a lab. The lab started with a petri dish of 4 bacteria- α . After 1 hours, the petri dish has 37 bacteria- α . Based on similar bacteria, the lab believes bacteria- α triples after some undetermined number of minutes.

- A. About 246 minutes
- B. About 29 minutes
- C. About 176 minutes
- D. About 41 minutes
- E. None of the above

9. A town has an initial population of 50000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	50040	50080	50120	50160	50200	50240	50280	50320	50360

- A. Non-Linear Power
- B. Linear
- C. Logarithmic
- D. Exponential
- E. None of the above

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10. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate (*rounded to the nearest minute*) replication rate of bacteria- α .

A newly discovered bacteria, α , is being examined in a lab. The lab started with a petri dish of 3 bacteria- α . After 3 hours, the petri dish has 9022 bacteria- α . Based on similar bacteria, the lab believes bacteria- α quadruples after some undetermined number of minutes.

- A. About 15 minutes
 - B. About 35 minutes
 - C. About 93 minutes
 - D. About 212 minutes
 - E. None of the above
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